# HIGH-IMPACT
## *Life and Death Series*
## ELECTRICAL SAFETY

This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation. Featured are:

**INTRODUCTION**: A brief description of the program and the subject that it addresses.

**PROGRAM OUTLINE:** Summarizes the program content. If the program outline is discussed before the video is presented, the entire program will be more meaningful and successful.

**PREPARING FOR AND CONDUCTING THE PRESENTATION:** These sections will help you set up the training environment, help you relate the program to site-specific incidents, and provide program objectives for focusing your presentation.

**REVIEW QUESTIONS AND ANSWERS:** Questions may be copied and given to participants to document how well they understood the information that was presented. Answers to the review questions are provided separately.

**ATTENDANCE RECORD:** Document the date of your presentation and the instructor as well as names of the program participants. The attendance record may be copied as needed.

### INTRODUCTION

The majority of on-the-job electrocutions occur in work areas where tools and equipment have already been determined to be safe. Why? These fatalities happen because workers fail to follow their company's approved job procedures. In fact, three-fourths of all electrical accidents are the result of unsafe work practices. Our work practices reflect our perceptions about safety and influence the decisions we make as we go about completing our daily tasks. We must remember that these decisions have life or death consequences, not only for ourselves but for our co-workers as well.

This video focuses on the electrocution death of Donna Myers, whose badly-burned body was found lying next to the conveyor on the assembly line where she worked. A finger nail file found next to her hand suggested that she had tried to make some type of adjustment to the conveyor, although was not authorized to perform such a task. Because no one was in the area when the incident occurred, co-workers are not sure exactly what happened to cause Donna's death.

As the investigation proceeds, plant employees recollect past electrical accidents that could provide some clue as to what had actually occurred. What they discover is that Donna's death was the result of several mistakes made by contractors who had previously been working on the assembly line. Donna's life would have been spared if safe work practices had been faithfully followed by these contractors. Viewers will learn valuable safety lessons from the events surrounding Donna's death and from the accidents recalled by her co-workers.

Training topics of the program include qualified and unqualified employees, contact with electrical energy, use and inspection of power tools, proper grounding, lockout/tagout, recognizing electrical hazards and the dangers of exposed electrical parts.

### *PROGRAM OUTLINE*

### BACKGROUND

- Over 400 fatalities relating to electricity occur each year as a result of personal failures to follow approved safe work practices.

- Because so many of these fatalities occur in manufacturing where safety devices and procedures have been put in place to prevent such tragedies, we must assume that the problem is not with the equipment. Instead, these accidents are caused by our failures to respect a) the power of electricity, b) the value of the training we have received, and c) the knowledge that decisions we make on the job have consequences for everyone at the plant.

**CONTACT WITH ELECTRICAL ENERGY**

- People come into contact with hazardous energy in one of five ways:
  1) by direct contact with an energized power line;
  2) by direct contact with energized equipment;
  3) boomed vehicle comes into contact with an energized power line;
  4) improperly installed or damaged equipment;
  5) allowing conductive equipment to come in contact with an energized power line.

- While we all understand that high voltages are dangerous, few of us understand that only a small amount of electricity is required to kill. For instance, the current from a 7.5 watt, 120 volt Christmas tree lamp passing across the chest is sufficient for electrocution.

- Engineering controls, such as insulation on wires and tools, are one form of protection from contact with electrical energy.

- Safe work practices, including lockout/tagout and accepted electrical safety procedures, are another way we protect ourselves from electrocution.

- Protective equipment that is specifically rated, designed and maintained for electrical work also provides protection.

- The most significant element in protecting ourselves and others in the plant is a personal commitment to safe work practices.

**QUALIFIED & UNQUALIFIED WORKERS**

- To be qualified, you must know and understand the potential hazards you may encounter. You must also understand the construction and operation of the particular equipment on which you are working.

- You must have the ability to distinguish exposed live parts and their voltages from other parts of the electrical equipment.

- You must also understand the voltages involved and the clearance distances for any voltages to which you will be exposed.

- Only qualified persons may open electrical enclosures where live parts may be exposed. Unqualified persons must remain at least ten feet from exposed live lines or parts.

**POWER TOOLS AND CORDS**

- You should inspect the insulated grips on tools before use to make sure they are free from cracks or worn areas. If the insulation is damaged, discard the tool or have it tagged out of service.

- Inspect the tool's power cord to make sure it is free from nicks and cuts. Also look for worn or frayed insulation and cracks in the plug.

- All electrical tools should bear the original manufacturer's identification plate.

- Tools must be rated for the area where they are used. Hazardous areas are designated by class and tools used in them must conform to that rating.

- Do not allow tools to come into contact with energized objects.

- All electrical cables should be inspected for nicks, cuts or damaged insulation before use.

- If guards are required, make sure they are in place and working properly.

**PROPER GROUNDING**

- Ground fault circuit interrupters, or GFCI's as they are also known, provide protection from currents that leak out of cords and tools. They should be used in highly conductive settings or where wet conditions exist.

- GFCI's break the circuit when they detect any current flowing through objects or people instead of the proper conductor.

- Portable GFCI's should be placed near the point of operation. Remember that they only provide protection from line to ground shorts, not line to line.

**LOCKOUT/TAGOUT**

- Only trained and qualified employees are allowed to perform lockout/tagout procedures.

- Before servicing any electrical circuit of piece of equipment, all hazardous energy sources must be de-energized and locked out.

- Always make sure the disconnects are marked legibly and their purpose is evident.

- After the sources of energy are locked and tagged, test the circuit by trying the on/off controls to make sure all energy is locked, blocked, drained or isolated.

- If the electrical circuits are still energized, you may be able to check the disconnect mechanism to verify that the blades have disengaged properly.

- Always verify the condition of a voltage meter by testing it on a known circuit before and after use.

- To determine which pieces of equipment must undergo lockout procedures, consult your company's written electrical safety-related work practices or lockout/tagout procedures. You may also ask your supervisor.

- Everyone working on the job must place his or her own lock on the lockout device. Locks and tags are standardized within your company and may not be used for any other purpose.

## ACCIDENTS AND THEIR SAFETY LESSONS

### Donna's Accident

The video follows the search for an explanation of Donna's death at the conveyor In the end, a series of mistakes made by outside contractors resulting in grounding errors is identified as the cause.

### Accident 1: Contract Worker Killed When Angle Iron Contacts Live Parts

A maintenance electrician troubleshooting a motor controller left the door open to the control box. A contract worker taking a piece of angle iron to another part of the plant rammed it into the live parts inside the box and was electrocuted.

**Safety Lesson:** ***Always keep doors and covers closed when live parts are inside.***

### Accident 2: Unqualified Operator Electrocuted While Making Adjustments

An unqualified operator opened a control panel to make adjustments. He had seen a qualified worker do this before and figured he could do it himself. He contacted live parts inside and was electrocuted.

**Safety Lesson:** ***You must be qualified, trained and authorized before you open electrical panels and before performing any electrical work.***

### Accident 3: Adjustment to Live Machine Results in Death

A maintenance mechanic responded to a call about the speed control being out of adjustment on a machine. He decided to make the adjustment with the power on because it was quicker to do it live. He ***might*** have gotten away with this safety violation if the insulation on his pliers had not been torn and if he had used the appropriate tool.

**Safety Lessons:**

***1) Don't be tempted to take short cuts with electricity. The negative consequences are immediate and often fatal.***
***2) Keep all tools in good working condition; don't use defective tools or ones not suited to the task.***

**Accident 4: Two Employees Electrocuted When Forklift Strikes Bus Duct**

A forklift operator was working too fast and ran the truck's mast into an overhead bus duct. This caused a steel storage rack to become energized and two of the operator's co-workers in contact with the rack were electrocuted.

**Safety Lessons:**
***1) Be aware of all forms of electrical energy and keep a safe distance away.***
***2) Never allow tools or other conductive items to contact live electrical parts or lines.***

**Accident 5: Welder Killed When Faulty Cable Contacts Metal Table**

A welder failed to inspect his cables for damaged insulation before use. As he proceeded to weld, the bare cable contacted the metal table. After he removed his gloves, he picked up the ground lead and was electrocuted.

**Safety Lessons:**
***1) Inspect all equipment and cables before use.***
***2) Don't let time pressure cause you to violate safety rules.***
***3) Always wear the required PPE.***

**Accident 6: Fireball in Confined Space Engulfs Maintenance Mechanic**

A maintenance mechanic was working to replace a manifold at the bottom of a tank. He failed to get a current confined space permit and also failed to use explosion-proof tools. When he turned on the portable electric tool, its sparks ignited a huge fireball that killed him.

**Safety Lessons:**
***1) Always inspect electric tools before using them and be sure that they are properly rated for the environment for which they are to be used.***
***2) Always follow all safety requirements, including confined space and lockout rules.***
***3) Don't assume the air in a confined space is good today just because it was good yesterday. Get a new permit today.***

**Accident 7: Electrician Electrocuted in Wet Area When Work Light Shorts Out**

A maintenance electrician was preparing to perform routine maintenance on a generator in a wet area. When he discovered that the GFCI on his work light was defective, he decided to proceed without using one. When the light shorted out, he was electrocuted.

**Safety Lessons:**
***1) Always use required safety equipment. In this case, the GFCI probably would have saved his life.***
***2) Don't let haste or inconvenience cause you to cheat your own safety.***

**Accident 8: Maintenance Worker Mangled in Cleaning Machine**

A maintenance mechanic was sent to get a large crucible cleaner back into operation. He thought he had locked out the disconnect and asked the operator to push the red start button. When the machine failed to start, the mechanic assumed he had turned off the proper disconnect to the machine. When to his horror the machine started while he was inside, he learned that it was not locked out.

**Safety Lessons:**
***1) Always use proper lockout procedures before working on equipment.***
***2) Verify for yourself that proper circuits are locked out. This will eliminate communication errors. In this case, the wrong red button was pushed by the operator.***

**PREPARE FOR THE SAFETY MEETING OR TRAINING SESSION**
Review each section of this Leader's Guide as well as the videotape. Here are a few suggestions for using the program:

Make everyone aware of the importance the company places on health and safety and how each person must be an active member of the safety team.

Introduce the videotape program. Play the videotape without interruption. Review the program content by presenting the information in the program outline.

Copy the review questions included in this Leader's Guide and ask each participant to complete them.

Copy the attendance record as needed and have each participant sign the form. Maintain the attendance record and each participant's test paper as written documentation of the training performed.

**Here are some suggestions for preparing your videotape equipment and the room or area you use:**

Check the room or area for quietness, adequate ventilation and temperature, lighting and unobstructed access.

Check the seating arrangement and the audiovisual equipment to ensure that all participants will be able to see and hear the videotape program.

Place or secure extension cords to prevent them from becoming a tripping hazard.

**CONDUCTING THE PRESENTATION**
Begin the meeting by welcoming the participants.

Introduce yourself and give each person the opportunity to become acquainted if there are new people joining the training session.

Explain that the primary purpose of the program is to motivate employees to respect the tremendous power of electricity and to show viewers that their failure to follow approved electrical safety rules can have devastating consequences for themselves and their co-workers.

Introduce the videotape program. Play the videotape without interruption. Review the program content by presenting the information in the program outline.

Lead discussions about specific equipment and operations at your facility where electrical hazards are present. Use the review questions to check how well the program participants understood the information.

After watching the videotape program, the viewer will be able to explain the following:

- How unsafe work practices involving electricity can result in tragic injuries and deaths;
- What specific knowledge is required in order to be qualified to work on particular equipment or systems;
- Why power tools and cords must be inspected for damage before each use;
- Why lockout/tagout, proper grounding and other accepted electrical safety practices are essential to maintaining an injury-free workplace.

**HIGH-IMPACT**

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***REVIEW QUESTIONS***

**Name_____Date_____**

***The following questions are provided to check how well you understand the information presented during this program.***

1. What causes three-fourths of all electrical accidents?

a. power tool malfunction
b. failure of GFCI's to work properly
c. person contacting a downed, live power line
d. unsafe work practices by employees

2. It is possible for a small current, such as that from a 7.5 watt, 120-volt lamp, to electrocute someone.

a. true
b. false

3. Unqualified workers must remain at least _____ feet away from exposed live lines or parts.

a. 3
b. 5
c. 8
d. 10

4. Any tool can be used in a area classified as hazardous as long as you have inspected it for damage before use.

a. true
b. false

5. From which type of shorts do GFCI's offer protection?

a. line to line
b. line to ground
c. both a and b
d. none of the above

6. Only qualified employees are allowed to perform lockout/tagout procedures.

a. true
b. false

7. How can you determine if a piece of equipment you are servicing needs to be locked and tagged out?

a. consult the company's written lockout procedure
b. consult the company's written electrical safety-related work practices
c. ask your supervisor
d. all of the above

8. Which of the following best describes the cause of Donna's death in the video?

a. she was electrocuted while making an adjustment with her fingernail file
b. a co-worker had improperly rigged the reset to the motor on her conveyor
c. improper grounding by contractors allowed equipment to become energized after a capacitor failed
d. none of the above

## *ANSWERS TO THE REVIEW QUESTIONS*

1. d
2. a
3. d
4. b
5. b
6. a
7. d
8. c